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FIG. 1

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FIG. 2

START

INITIALIZE M (k, i) — 201

SET AG (k), SN (k) — 202

UPDATA MESSAGE — 203

1 ITERATION PROCESS FINISHED ? — 204
NO
YES

DECODING FINISHED ? — 205
NO
YES

OUTPUT DECODED RESULT — 206

END

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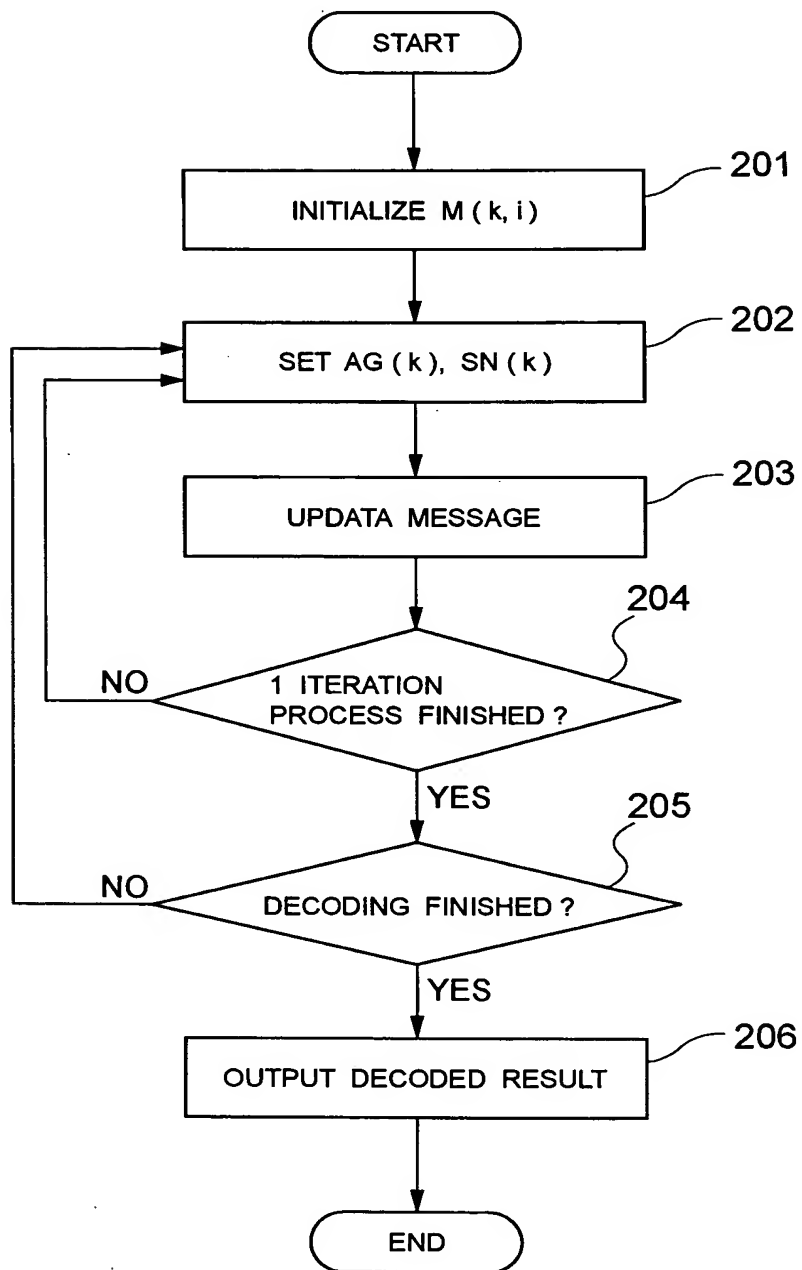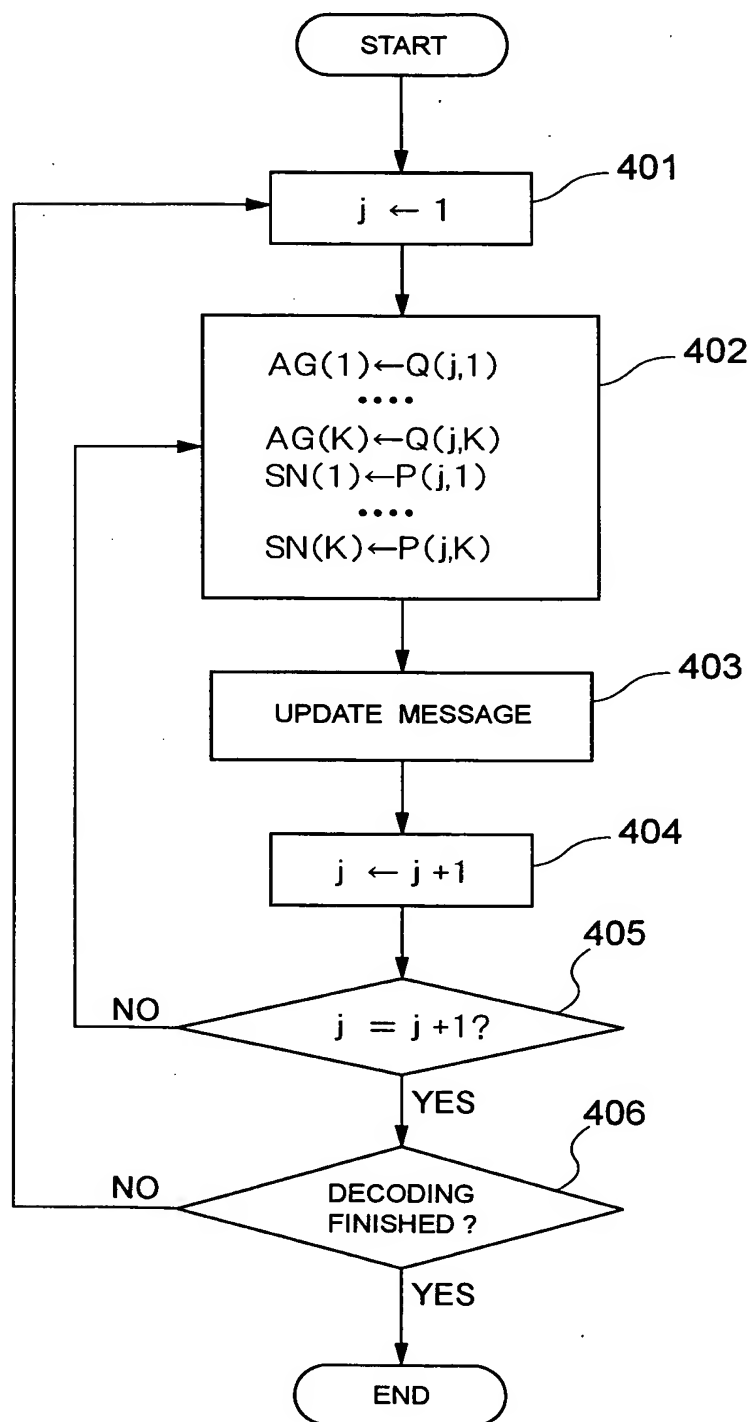and Method Used in the Same"
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FIG. 3

$$H = \begin{pmatrix} R(1,1) & \cdots & R(1,K) \\ \cdots & \cdots & \cdots \\ R(J,1) & \cdots & R(J,K) \end{pmatrix}$$

301

$$R(j,k) = Q(j,k) \otimes P(j,k)$$

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FIG. 4

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FIG. 5

START

501
$e \leftarrow 1$

502
GENERATE Q (j, k) [e] IN AG (k)

503
GENERATE MESSAGE IN VN (k,d),
UPDATE M (k,d)

504
(1) SEND MESSAGE ON THE
BASIS OF SN (k)

505
GENERATE MESSAGE IN CN (d)

506
(2) SEND MESSAGE ON THE
BASIS OF SN (k)

507
$e \leftarrow e + 1$

508
NO — $e = E + 1$?

YES

END

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FIG. 6

```
┌──────────┐          ┌──────────┐
│          │          │          │ ⌒ 601
│   M(1)   │  ••••    │   M(D)   │
│          │          │          │
└────┬─────┘      ┌───┴──────────┘
     │        ┌───┴───┐       ⌒ 602
     │        │  AG   │
     │        └───────┘
     │            │
┌────┴────┐   ┌───┴────┐  ⌒ 603
│  VN(1)  │•••│ VN(D)  │
└────┬────┘   └───┬────┘
┌────┴───────────┴────────┐ ⌒ 604
│          SN             │
└────┬───────────┬────────┘
     │           │
┌────┴────┐  ┌───┴────┐ ⌒ 605
│  CN(1)  │••│ CN(D)  │
└─────────┘  └────────┘
```

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FIG. 7

START

701    $j \leftarrow 1$

702    $e \leftarrow 1$

703    $k \leftarrow 1$

704    $AG \leftarrow Q(j,k)$
$SN \leftarrow P(j,k)$

705   GENERATE $Q(j,k)[e]$ IN AG

706   GENERATE MESSAGE IN $VN(d)$, UPDATE $M(d)$

707   (1) SEND MESSAGE ON THE BASIS OF SN

708   (1) GENERATE MESSAGE IN $CN(d)$

709   (2) SEND MESSAGE ON THE BASIS OF SN

710    $k \leftarrow k + 1$

711    $k = K + 1$?   NO

712   YES   (2) GENERATE MESSAGE IN $CN(d)$

713    $e \leftarrow e + 1$

714    $e = E + 1$?   NO

715   YES $j \leftarrow j + 1$

716    $j = J + 1$?   NO

717   YES   DECODING FINISHED?   NO

YES

END

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FIG. 8

801

U → | DECODER H'(U/P)=0 | → U / P → | INTERLEAVE | → C

802

FIG. 9A

$$(Q(j,k)) = \begin{pmatrix} 1\ 0 & 0\ 1 & 1\ 0 \\ 0\ 1 & 1\ 0 & 0\ 1 \\ \hline 0\ 1 & 1\ 0 & 0\ 1 \\ 1\ 0 & 0\ 1 & 1\ 0 \end{pmatrix} \quad 901$$

FIG. 9B

$$(P(j,k)) = \begin{pmatrix} 0\ 0\ 1 & 1\ 0\ 0 & 0\ 1\ 0 \\ 0\ 1\ 0 & 0\ 1\ 0 & 0\ 0\ 1 \\ 1\ 0\ 0 & 0\ 0\ 1 & 1\ 0\ 0 \\ \hline 0\ 0\ 1 & 0\ 1\ 0 & 1\ 0\ 0 \\ 1\ 0\ 0 & 0\ 0\ 1 & 0\ 0\ 1 \\ 0\ 1\ 0 & 1\ 0\ 0 & 0\ 1\ 0 \end{pmatrix} \quad 902$$

FIG. 9C

$$H = (R(j,k)) = (Q(j,k) \otimes P(j,k)) = \begin{pmatrix} 0\ 0\ 1\ 0\ 0\ 0 & 0\ 0\ 0\ 1\ 0\ 0 & 0\ 1\ 0\ 0\ 0\ 0 \\ 0\ 1\ 0\ 0\ 0\ 0 & 0\ 0\ 0\ 0\ 1\ 0 & 0\ 0\ 1\ 0\ 0\ 0 \\ 1\ 0\ 0\ 0\ 0\ 0 & 0\ 0\ 0\ 0\ 0\ 1 & 1\ 0\ 0\ 0\ 0\ 0 \\ 0\ 0\ 0\ 0\ 0\ 1 & 1\ 0\ 0\ 0\ 0\ 0 & 0\ 0\ 0\ 0\ 1\ 0 \\ 0\ 0\ 0\ 0\ 1\ 0 & 0\ 1\ 0\ 0\ 0\ 0 & 0\ 0\ 0\ 0\ 0\ 1 \\ 0\ 0\ 0\ 1\ 0\ 0 & 0\ 0\ 1\ 0\ 0\ 0 & 0\ 0\ 1\ 0\ 0\ 0 \\ \hline 0\ 0\ 0\ 0\ 0\ 1 & 0\ 1\ 0\ 0\ 0\ 0 & 0\ 0\ 0\ 1\ 0\ 0 \\ 0\ 0\ 0\ 1\ 0\ 0 & 0\ 0\ 1\ 0\ 0\ 0 & 0\ 0\ 0\ 0\ 0\ 1 \\ 0\ 0\ 0\ 0\ 1\ 0 & 1\ 0\ 0\ 0\ 0\ 0 & 0\ 0\ 0\ 1\ 0\ 0 \\ 0\ 0\ 1\ 0\ 0\ 0 & 0\ 0\ 0\ 0\ 1\ 0 & 1\ 0\ 0\ 0\ 0\ 0 \\ 1\ 0\ 0\ 0\ 0\ 0 & 0\ 0\ 0\ 0\ 0\ 1 & 0\ 0\ 1\ 0\ 0\ 0 \\ 0\ 1\ 0\ 0\ 0\ 0 & 0\ 0\ 0\ 1\ 0\ 0 & 0\ 1\ 0\ 0\ 0\ 0 \end{pmatrix} \quad 903$$

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FIG. 10B

FIG. 10A

	M(1,1)	M(1,2)	M(1,3)	M(2,1)	M(2,2)	M(2,3)	M(3,1)	M(3,2)	M(3,3)		c(1)	c(2)	r
1	1	2	3	7	8	9	13	14	15				
2	4	5	6	10	11	12	16	17	18				

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FIG. 11

c (1)	c (2)	c (3)	c (4)	r + c (1) + c (2) +c (3) + c (4)

FIG. 12

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FIG. 13

$$\begin{pmatrix} P & P & 0 & 0 & 0 & 0 & P & P & P & P \\ P & P & P & P & P & 0 & 0 & 0 & 0 & P \\ P & P & P & P & 0 & P & 0 & 0 & P & 0 \\ P & P & P & 0 & P & P & 0 & P & 0 & 0 \\ P & P & 0 & P & P & P & P & 0 & 0 & 0 \end{pmatrix}$$

FIG. 14A
PRIOR ART

$$H = \begin{array}{c} \begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \end{array} \\ \begin{pmatrix} 1 & 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 \end{pmatrix} \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \end{array} \end{array}$$

PARITY CHECK MATRIX H

FIG. 14B
PRIOR ART

TANNER GRAPH G

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FIG. 15
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